

Louisiana Coastal Area – Addressing Decades of Coastal Erosion

Scott A. Angelle, Secretary
Louisiana Department of Natural Resources
July 15, 2004

I would like to thank the Chairman and the Subcommittee for inviting me to testify today on a matter that is of the utmost importance to not only my state of Louisiana but to the nation as a whole. The coastal Louisiana ecosystem provides fish and wildlife habitat that supports the nation's second largest fishery and over \$1 billion per year in recreational fishing and hunting. This productive land also provides protection for infrastructure that produces or transports 30 percent of the nation's oil and gas supply and the nation's largest port complex by tonnage. This rich coastal land, which is home to two million Louisiana residents, is in grave danger. In the last 70 years, Louisiana has shrunk in land area by nearly 1900 square miles—an area nearly the size of the State of Delaware—and is projected to shrink by another 500 square miles in the next 50 years if more aggressive actions are not taken. This puts the fisheries, oil and gas infrastructure, ports, and residents at increased risk of loss due to ecosystem collapse and storm damage. From the state of Louisiana's perspective, this risk is unacceptable. We urgently need the assistance of the Federal government to restore sustainability to this great coastal ecosystem, a unique national treasure.

Background

The Mississippi River transports enormous volumes of sediments, nutrients and water from the heartland of America to the coastal area of Louisiana. Before this Nation was settled and developed, the Mississippi River had built over four million acres (6250 square miles [mi²]) of coastal swamps, marshes, barrier islands, and other associated habitats in coastal Louisiana through a process known as the “delta cycle”. The heart of the delta cycle is the ability of the river to alter its distributary course—when an existing course becomes inefficient, it is abandoned in favor of a more direct route to the Gulf of Mexico. When this channel switching occurs, the introduced sediment, nutrients, and fresh water are enough to counterbalance the natural process of subsidence and salt water and tidal influence, and a new sub-delta is created by building extensive new wetland areas. The abandoned sub-delta's wetlands receive less sediment and nutrients, and the natural subsidence and increased saltwater and tidal influences contribute to the slow degradation of the sub-delta. Despite this slow degradation, significant areas of coastal wetlands continue to be sustained by retaining some river influence, and habitat diversity increases as more saline marshes begin to dominate and the seaward edges are reworked into barrier headlands and barrier islands. The Mississippi River has changed its course several times during the last 7,000 years, and each time, the river has built a major sub-delta.

The delta cycle has been interrupted by activities which have allowed us to live and work in the coastal zone. Federally-authorized flood protection and navigation projects have reduced the sediment load of the Mississippi River, fixed the river and its distributaries in place, and confined their flows to the channel itself. These projects have provided significant flood damage reduction and navigation benefits to the Nation, but have had the unintended consequences of

accelerating the degradation of the entire coastal Louisiana ecosystem and preventing development of new sub-delta lobes. The annual floods and periodic river crevasses, which had built and sustained the coastal ecosystem, have been eliminated and most of the Mississippi River's fresh water, with its nutrients and sediments, flows directly into the Gulf of Mexico. The cumulative effects of human activities and natural processes in the coastal area have severely impaired the deltaic processes and shifted the coastal area from a condition of net land building to one of net land loss. Without significant intervention, the Louisiana coastal ecosystem will continue to decline, which will jeopardize the future economy of the region and the Nation.

Although the coastal Louisiana ecosystem contains 30 percent of the coastal marsh in the contiguous United States, it now accounts for 90 percent of the total coastal marsh loss. Coastal Louisiana has lost over 1.2 million acres (1,875 mi²), since the 1930s (Barras et al., 2003; Barras et al., 1994; and Dunbar et al., 1992). The rate of loss from 1990 to 2000 was about 15,300 acres per year (23.9 mi²/yr), much of which was due to the residual effects of past human activity (Barras et al., 2003). It was estimated in 2003 that coastal Louisiana would lose an additional 328,000-acres (513 mi²/yr) by the year 2050 (Barras et al., 2003) if more aggressive actions are not taken.

National Significance

Louisiana's coastal wetlands and barrier island systems provide many nationally significant economic and environmental services. They protect an internationally significant complex of shallow and deep-draft ports from the destructive forces of storm-driven waves and tides. This complex handles 21 percent of the Nation's waterborne commerce, more than any other port in the Nation, and has the most active segment of the Nation's Gulf Intracoastal Waterway (GIWW) (Waterborne Commerce Statistics Center (WCSC), 2002). Louisiana is also nationally important in its contribution to energy. In 2001 Louisiana's crude oil and natural gas production, including production from the outer continental shelf, ranked 1st and 2nd in the nation, respectively (LDNR, 2002). Capital investment in the Louisiana coastal area totals approximately \$100 billion. These investments include facilities, supporting service activities, and urban infrastructure (Waldemar S. Nelson, 2003) providing for over 2 million inhabitants (46 percent of the state's population). Coastal Louisiana's environmental services include commercial fishing landings at a dockside value of \$305 million in 2002, and account for approximately 30 percent of the total catch by weight in the lower 48 States (USDOC 2002). Expenditures on recreational fishing (trip and equipment) in Louisiana have been estimated to be between \$703 million (USFWS, 2002) and \$1.2 billion (Gentner et al., 2001).

In addition to their economic value, coastal Louisiana's wetlands provide very valuable environmental services. Louisiana's coastal wetlands contain an extraordinary diversity of coastal habitats ranging from narrow natural levee and beach ridges to forested swamps and freshwater, intermediate, brackish, and saline marshes. These unique habitats combine to place the coastal wetlands of Louisiana among the Nation's most productive and important environmental assets. Coastal wetlands are critical habitat to birds, including neotropical migratory songbirds, waterfowl, and water birds. Approximately 70 percent of all waterfowl that migrate through the United States use the Mississippi and Central flyways, for which Louisiana provides the most important wintering habitat. Additionally, coastal Louisiana provides critical nesting habitat for many species of water birds, such as the endangered brown pelican.

History of the Louisiana Coastal Restoration Program

Early coastal restoration efforts in Louisiana were often small and produced localized benefits. By the 1980s it was recognized that Louisiana needed to construct projects that mimic the deltaic land-building processes which had been disrupted by human actions. Since the 1980s, through implementation of projects of steadily increasing scale, it is now apparent that only a comprehensive ecosystem scale, process-based approach to restoration will achieve the necessary sustainable restoration benefits. The following is a brief history of the evolution of Louisiana's coastal restoration efforts.

Early Efforts

Responding to the crisis at hand, the state of Louisiana began constructing projects as early as the 1970's, and initiated a series of legislation to offset the catastrophic loss of coastal wetlands. The Louisiana State and Local Coastal Resources Management Act was passed in 1978 to regulate the developmental activities that affect wetland loss. The resulting Louisiana Coastal Resources Program became a federally approved coastal zone management program in 1980. Restoration projects built in these early years were mainly small-scale, state-funded projects designed for shoreline stabilization and marsh management.

State Legislation and CWPPRA

By 1989 increased understanding of the vastness of the land loss problem led to the creation of a dedicated source of funding and a structure to advance the state's restoration efforts. In 1989 the Louisiana Legislature passed Act 6 of the Second Extraordinary Session (R.S. 49:213-214), and a subsequent constitutional amendment which created the Coastal Restoration Division (CRD) within the Louisiana Department of Natural Resources (DNR), as well as the Wetlands Conservation and Restoration Authority (Wetlands Authority). Act 6 also established the State Wetlands Trust Fund, which provides revenues derived from oil and gas activities to wetland restoration efforts in Louisiana. Because of these actions, the State now has a secure and steady means to pay its cost-share of Federal coastal restoration projects, and is now staffed with technical experts who can effectively partner with their Federal counterparts in planning, designing and constructing restoration projects.

Federal support came in 1990 when the United States Congress passed the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA; Public Law 101-646, Title III) to contribute federal monies to state restoration activities. Since passage, CWPPRA has provided approximately \$50 million annually to plan and construct wetland restoration projects in Louisiana. To date, 68 projects have been constructed at a cost of \$258 million, and another 64 are currently in the design phase (LDNR, 2003).

Additionally, CWPPRA created a strategic and productive partnership between Louisiana and five federal agencies: the United States Departments of the Army, Agriculture, Commerce, and Interior; and the United States Environmental Protection Agency. We have used the knowledge gained from implementing this program to design and build projects that are more effective in meeting their restoration goals.

Other Federal Support

Between 1992 and 2002 the United States Army Corps of Engineers (USACE) constructed two significant freshwater diversion projects along the Mississippi River near New Orleans at a total cost of \$147 million (LDNR, 2003). Authorized through the Water Resources Development Act (WRDA), the Caernarvon and Davis Pond river diversions have the potential to benefit vast areas of deteriorating marsh by introducing beneficial freshwater, sediment, and nutrients. It is anticipated that these river diversions will benefit over 51,200 acres of wetland habitat (LDNR, 2003). Construction and operation of those projects have given us confidence that the technology is sound and an effective means of restoring our coastal wetlands.

In addition to freshwater diversion projects, Section 204 of WRDA 1992 allows for wetland restoration through the beneficial use of dredged material. For example, material from the maintenance dredging of Federal navigation canals can be used to create land in open water areas, applied in thin layers to bring degraded wetlands up to intertidal elevation, or used to stabilize eroding natural wetland shorelines. However, this funding source is of minimal use, relative to the enormity of the problem facing coastal Louisiana because Federal expenditures on Section 204 projects are not to exceed \$15 million annually for the Nation. Between the years of 1991 and 2002, thirteen Section 204 projects were built in Louisiana at a total cost of \$11.3 million. This equates to less than 20 percent of the 70 million cubic yards of material annually dredged in Louisiana being used beneficially (LDNR, 2003).

Coast 2050 Plan

All of these efforts have advanced coastal restoration in Louisiana, by providing greater understanding of what ecosystem responses may be expected from different restoration techniques, and which techniques are most appropriate for various coastal regions. Through this work, it was also recognized that, while smaller site-specific projects are effective, an ecosystem-level, process-based approach to coastal restoration is needed to restore this national treasure. Therefore, a significant planning effort was initiated in 1997, resulting in a report entitled "Coast 2050: Toward a Sustainable Coastal Louisiana" (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority, 1998). This plan included input from private citizens, local governments, state and federal agency personnel, and the academic community. Additionally, "Coast 2050" focused all efforts of participating agencies on the common goal of creating a comprehensive, ecosystem-level coastal restoration plan that utilized the best available scientific knowledge, and emphasized the need for a larger scale, more encompassing attitude toward coastal restoration. This document was the basis of a USACE reconnaissance report approved in May 1999. While this report was a landmark achievement which outlined the general ecosystem strategies needed to restore coastal Louisiana, it did not contain the details needed for implementation.

Basin-Scale Studies

In February 2000, the interagency team which had been working in concert on coastal restoration since the inception of CWPPRA began working on implementation of Coast 2050 taking a 10-year basin-by-basin approach. The study focused on Barataria Basin Wetland Creation and Barataria Basin Barrier Shoreline Restoration. In support of this planning process, development was also begun on a basin-wide hydrodynamic model. However, it became apparent that this basin-by-basin approach to planning for coast-wide restoration did not allow managers to

compile all information needed for setting priorities, and could not be implemented in a timely manner.

LCA Comprehensive Plan

Thus, in March 2002 the interagency team, aided by the academic community (together referred to as the Project Delivery Team [PDT]) initiated the Louisiana Coastal Area comprehensive ecosystem restoration study with the goal of developing a comprehensive multiple basin plan which could serve as the blueprint for implementation. The resulting draft report, entitled "Louisiana Coastal Area, LA – Ecosystem Restoration: Comprehensive Coastwide Ecosystem Restoration Study", focused on such restoration features as river diversions, barrier island and other geomorphic structure restoration, shoreline protection, and hydrologic restoration. Basin-scale modeling tools, which represent the best available scientific understanding of coastal Louisiana ecosystem function, were developed to aid in the development of the most ecologically beneficial and cost-effective 30-year construction program to restore coastal Louisiana. Other important outcomes of this draft report included the interagency and academic partnerships which will serve as the basis for the establishment of a future Science & Technology (S&T) program.

LCA Near-Term Plan

Based on guidance given in the President's Fiscal Year 2005 budget request, the LCA Comprehensive Plan was revised to focus on a near-term plan of action which addresses the most critical ecological needs of the coast. This proposed plan is a small subset of the Comprehensive Plan, comprised of those critical restoration studies, projects, and programs that could be implemented within a ten-year timeframe. This first phase of implementation represents an opportunity to construct projects in areas of critical need and to continue the advancement of scientific and technological knowledge for optimization of future project construction.

Released on July 9, 2004 for public review, the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study (LCA Study) begins to address the following critical needs: preventing future land loss, restoring connections to river resources in degrading areas, restoring endangered geomorphic structures such as barrier islands and land bridges, and protecting vital community and socioeconomic resources.

Goal and Purpose

The goal of the LCA Study is to reverse the current trend of degradation of the coastal ecosystem. The purpose of the LCA Study is to:

- Identify the most critical ecological needs of the coastal area;
- Present and evaluate conceptual alternatives for meeting the most critical ecological needs;
- Identify the kinds of restoration features that could be implemented in the near-term (within 5-10 years) that address the most critical ecological needs;
- Establish priorities among the identified near-term restoration features;
- Describe a process by which the identified priority near-term restoration features could be implemented;
- Identify the key scientific uncertainties and engineering challenges facing the effort to protect and restore the ecosystem, and propose a strategy for resolving them;

- Identify, assess and, if appropriate, recommend feasibility studies that should be undertaken within the next 5-10 years to fully explore other potentially promising large-scale restoration concepts; and
- Present a strategy for addressing the long-term needs of coastal Louisiana restoration beyond the near-term focus of the LCA Study.

LCA Study Recommendations

The LCA Ecosystem Restoration Study components include:

- *Programmatic Authority for 5 critical restoration features* (\$786 million): Construction will be subject to follow-up decision documents. All restoration features have been deemed to have significant restoration benefits in the most critically degraded areas of the coast, are based in proven technology, and already have initial design efforts in progress.
- *Approval of an implementation plan of eight additional near-term critical restoration features for which a standard authorization process will be followed* (\$730 million): These projects have been deemed to have significant restoration benefits in the most critically degraded areas of the coast and are based in proven technology; however, significant design efforts have not been initiated on these projects.
- *Authorization of a Science and Technology (S&T) Program* (\$100 million over 10 years): The S&T Program would provide a strategy, organizational structure, and process to facilitate effective programmatic incorporation of advancing science and technology.
- *Authorization of Science and Technology Demonstration Projects* (\$175 million over 10 years): Authorization of demonstration projects would allow for the resolution of critical areas of scientific and engineering uncertainty while providing meaningful restoration benefits whenever possible. Information garnered from these projects would be used to advance the restoration program.
- *Programmatic Authority for the Beneficial Use of Dredged Material* (\$100 million over 10 years): On average, only approximately 20 percent of the 70 million cubic yards (mcy) of material that is dredged annually in Louisiana is used for marsh creation. It has been estimated that an additional 30 mcy could reasonably be used for the purposes of marsh creation adequate funding were available. This programmatic authority would allow up to 21,000 acres (32.8 square miles) of wetlands to be created over the next ten years.
- *Programmatic Authority for Modification to Existing Structures* (\$10 million over 10 years): Opportunities for modifying or rehabilitating existing structures and/or their operation to achieve cost-effective, expedited restoration benefits should be explored. Initiation of studies of restoration opportunities relative to such modifications requires advanced budgeting; therefore, programmatic authority is requested to initiate such studies.
- *Approval of a plan for assessing the feasibility of potentially promising large-scale restoration feature concepts* (\$60 million): Very large-scale restoration concepts which exhibit significant potential to contribute to achieving restoration objectives need to be further analyzed and confirmed in order to determine how best to incorporate them, if at all, into the LCA Program. These include such concepts as the

"Third Delta", which proposes the construction of a channel from the Mississippi River to degraded areas of Barataria and Terrebonne basins that would transport Mississippi River water at a rate up to 250,000 cubic feet per second in order to build new sub-deltas in these regions.

The total cost of the LCA Study near-term plan is \$1.961 billion over 10 years.

Adaptive Management

The vibrant ecosystem found in coastal Louisiana is a product of an ever-changing, natural environment. While this dynamic condition provides the energy which created and sustains the ecosystem, it also ensures that scientific knowledge of this – or any – ecosystem is far from complete. Therefore, scientific uncertainties are unavoidable when managing large-scale ecological systems. Additionally, because construction of restoration projects on the scale required for restoration of coastal Louisiana is unprecedented, there is also a degree of technical and engineering uncertainty associated with this restoration effort. However, if properly acknowledged and addressed, these uncertainties need not hinder the progress of a restoration program.

Through a process called adaptive management, uncertainties may be identified and resolved throughout a program's implementation, and the resulting information may be continuously incorporated to improve the operation and design of existing and future projects within a restoration program. This process has been ongoing for the past 14 years in Louisiana, where knowledge gained from past restoration projects as well as academic research initiatives has been used to improve our understanding of the types and operation of restoration features which most effectively address the goal of reversing the trend of degradation of the coastal Louisiana ecosystem.

The LCA Study builds upon the best available science and engineering knowledge garnered from previous restoration efforts in Louisiana. The LCA Study presents a near-term restoration plan which is based in extensive scientific understanding and proven technology. Because there are uncertainties associated with other promising techniques, the LCA Study also recommends a coordinated Science & Technology program and demonstration projects to ensure that implementation continues to rely on the best available technology. An adaptive management program has also been incorporated into the LCA program in order to ensure that lessons learned continue to be incorporated into future planning efforts.

Future

Over the past 20 years, the State of Louisiana and its Federal partners have learned a great deal about the causes of the coastal crisis and the necessary actions that will restore sustainability to the coastal Louisiana ecosystem. As our scientific and technical knowledge has grown, we have also discovered that existing policies and procedures are limiting our capability to address this critical problem in a timely manner and on meaningful scales. We therefore propose the following actions to facilitate the restoration of the coastal Louisiana ecosystem.

Comprehensive Authorization

Our experience with the CWPPRA program has shown that we can build effective relatively small restoration projects that restore and protect discrete areas of coastal habitat. In addition, our two WRDA-authorized river diversions have shown that we can produce significant beneficial ecosystem effects on a basin scale. All of these efforts have shown, however, that a project-by-project approach is not adequate to provide a systemic and coordinated solution. Beginning with the Coast 2050 effort in the late 1990's, we recognized that a long-term, comprehensive restoration plan relying on a systems-approach was vital to achieve the goal of establishing a sustainable coastal ecosystem. We firmly believe that a long-term, comprehensive restoration plan is necessary for the restoration of the coastal Louisiana ecosystem. The state of Louisiana and the USACE had prepared such a comprehensive report that would provide a programmatic basis for comprehensive implementation of the Coast 2050 Plan. However, in response to the guidance given in the President's Fiscal Year 2005 budget request, the state of Louisiana agreed to scale back and refocus this comprehensive planning effort on a more short-term effort to address only some of the critical ecosystem needs. Although this first phase of implementation yields an excellent opportunity to construct projects in some areas of critical need, many more areas of need remain to be addressed. We firmly support the full authorization of the recommendations in the *Louisiana Coastal Area (LCA)*, *LA Ecosystem Restoration Study* report as a necessary first step, but we believe that this effort is not enough. A comprehensive report must be prepared in an expedited manner and authorized as soon as possible.

Cost Sharing and Appropriations

Current law requires a cost share ratio of 65 percent Federal and 35 percent non-Federal for construction of ecosystem restoration projects with 100 percent non-Federal responsibility for operations, maintenance, repair, replacement, and rehabilitation (OMRR&R). We are requesting the non-Federal share of program implementation be set at 25 percent, including construction and OMRR&R costs. The State of Louisiana believes this alternative cost share scenario is appropriate and justified based on the root cause of the problem, historical precedence, and the national scope of the problem.

Other existing federally authorized projects constructed in Louisiana have provided significant flood damage reduction and navigation benefits. An unintended consequence of these projects, however, was the disruption of natural processes that has directly contributed to the need for coastal restoration. Without modification of these federal projects, many constructed at 100 percent Federal cost, further decline of the coastal ecosystem is a certainty.

The non-Federal cost-share obligation for construction and OMRR&R of two Water Resources Development Act projects in the vicinity of New Orleans, the Caernarvon and Davis Pond freshwater diversion projects is 25 percent. These projects were built following final authorization in the WRDA of 1986, and are similar to several projects proposed in the LCA study for near-term implementation.

In addition, the nation derives considerable benefits from the coastal Louisiana ecosystem. The Louisiana coastal area provides protection for the production and transport of about 30 percent of the nation's oil and gas supply, supports the nation's second largest commercial fishery and supplies significant navigation and port facilities. If land loss is not addressed aggressively,

there will certainly be national impacts, including increased risk to the security of the country's energy supply. Allowing for reduced non-Federal cost share ratios and ensuring adequate Federal appropriations are critical to maintain an optimal schedule for construction of these vital projects.

Streamlined Implementation Process

While it is important to maintain checks and balances to ensure wise and efficient use of resources, program requirements should not preclude a timely response to this urgent problem. The traditional process used by USACE for project planning, design, and construction is too cumbersome and slow to address a problem of this magnitude in a timely manner. For example, the Davis Pond project was authorized by the Flood Control Act of 1965, (PL 89-298) and was further amended by the Water Resources Development Acts (WDRA) of 1986 (PL 99-622), and 1996 (PL 104-303). Construction began in 1996, and operation finally began in 2002, nearly 40 years after project conception. Davis Pond is a landmark project providing substantial ecosystem benefits; however, constructing future projects on this same time scale is not adequate to address the critical and urgent nature of the problems facing the coastal Louisiana ecosystem. Therefore, streamlined procedures for preparation and submission of decision documents need to be developed. These documents should provide adequate assurances that the projects will be effective and cost-efficient in meeting their objectives, but should not be traditional feasibility reports. In addition, expedited mechanisms should be created to implement projects that have undergone extensive engineering and design efforts under other State and Federal programs. Lastly, coastal ecosystem restoration projects should be justified solely on National Ecosystem Restoration benefits, although ancillary economic impacts and benefits should be considered and reported. The programmatic authority recommended in the *Louisiana Coastal Area Ecosystem Restoration Study* report is a good example of streamlined processes, and needs to be fully endorsed and implemented.

Summary and Conclusions

Because of the unintended consequences of activities which have allowed us to live and work in the coastal zone, the natural processes which built and historically maintained coastal Louisiana have been disrupted to the point where this ecosystem is on the verge of collapse. It is estimated that approximately 1900 square miles – an area the size of Delaware – has been lost since the 1930s, and another 500 square miles could be lost in the next 50 years if no further action is taken to combat the problem (Barras et al., 2003). This crisis is not only a concern for local and regional interests, but also to the Nation as a whole because of the tremendous benefits this region provides. Failure to act puts the fisheries, oil and gas infrastructure, ports, and residents at increased risk of loss due to ecosystem collapse and storm damage.

State constitutional amendments passed in October 2003 and state legislation passed in 2004 have bolstered funding for the restoration program and limited potential liability associated with project construction. This shows that Louisiana's citizens and legislators are willing to make sacrifices for aggressive action. On a procedural level, the amendments specifically make important first steps toward addressing previously intractable problems of funding and liability. Decades of coastal restoration research and projects have taught us much about what types of restoration projects work, what projects do not work, and –very importantly – how to structure a program which will allow us to advance the coastal restoration program and rise to the challenge facing us today. This improved program readiness has already engendered increased confidence

among Louisiana's federal coastal restoration partners. In addition, these efforts are receiving international attention as a model of how to proceed with wetland restoration, as evidenced by the recent visit of the Iraqi Minister of Water Resources.

We urgently need the assistance of the Federal government to restore sustainability to this great coastal ecosystem, a unique national treasure. Specifically, we need the LCA Study to be authorized and funded in its entirety. We have already trimmed this request from the estimated \$14 billion needed to restore the coast over a 30-year period down to a \$1.9 billion plan which is comprised of the most critical actions needed in the next 10 years. We strongly believe that the near-term plan described in the LCA Study represents the minimum possible effective action, and must not be further compromised. It is essential that this plan have a streamlined implementation process, as the usual decades that it has taken to for planning, design, and construction of WRDA projects is not an option. In addition, it is crucial that a comprehensive program be authorized to ensure that this vital national treasure is preserved. Given the tremendous resources the state of Louisiana provides to the Nation and the consequences the Nation will face if these resources are compromised, we believe that a 25 percent state cost share is justified.

Louisiana is only 1.5 percent of the area of the entire United States, yet we handle 21 percent of the total waterborne commerce, 30 percent of all oil and gas consumed in the country, and provide 30 percent of the seafood from the lower 48 states (Waterborne Commerce Statistics Center (WCSC), 2002; LDNR, 2002; NMFS, 2003). All of these resources are threatened by the land loss crisis facing coastal Louisiana. Many valuable lessons have been learned and a blueprint for Louisiana's future has been developed. We are prepared and ready to take the next steps needed to restore America's Wetland.

Literature Cited

- Barras, J.A., P.E. Bourgeois, and L.R. Handley. 1994. Land loss in coastal Louisiana 1956-90. National Biological Survey, National Wetlands Research Center Open File Report 94-01, 4 p., 10 color plates.
- Barras, J., S. Beville, D. Britsch, S. Hartley, S. Hawes, J. Johnston, P. Kemp, Q. Kinler, A. Martucci, J. Porthouse, D. Reed, K. Roy, S. Sapkota, and J. Suhayda. 2003. Historical and projected coastal Louisiana land changes: 1978-2050: USGS Open File Report 03-334, 39 p.
- Dunbar, J.B., L.D. Britsch, and E.B. Kemp. 1992. Land loss rates: Louisiana Coastal Plain. Technical Report GL-92-3, U. S. Army Engineer Waterways Experiment Station, Vicksburg MS, 28 p.
- Gentner, B., M. Price, and S. Steinbeck. 2001. Marine Angler Expenditures in the Southeast Region, 1999. NOAA Technical Memorandum No. NMFS-F/SPO-48.
- Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. Louisiana Department of Natural Resources. Baton Rouge, Louisiana. 161 pp.
- Louisiana Department of Natural Resources. 2003. Coastal Restoration Annual Project Reviews. Baton Rouge, Louisiana. December 2003.
- Louisiana Department of Natural Resources, Technology Assessment Division. 2002. Louisiana Energy Topic. Baton Rouge, LA.
- NMFS, Fisheries Statistics and Economics Division. 2003. "Fisheries of the United States, 2002". Silver Spring, Maryland.
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration, and National Marine Fisheries Service. 2002. Fisheries of the United States, 2002. Washington D.C.
- U. S. Fish & Wildlife Service. 2002. 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation - State Overview.
- U.S. Bureau of the Census. 1998. Bureau of the Census, Survey Processing, and Products Branch, Washington, D.C. Internet URL: <http://www.census.gov>
- Waldemar Nelson and Company. 2003. Valuation of Assets in the Louisiana Coastal Area. Prepared with U. S. Army Corps of Engineers, New Orleans District.
- Waterborne Commerce Statistics Center, U. S. Army Corps of Engineers. 2002. The U.S. Waterway System -- Transportation Facts.